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MATERIAL HANDLING WORKSTATION – OPERATOR MANUAL

May 19, 1988

By:
Carl E. Wenger

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I. INTRODUCTION

1. PURPOSE OF THIS DOCUMENT

The purpose of this document is to provide operating instructions for the AMRF Material Handling Workstation (MHWS). The material handling equipment includes Automatic Guided Vehicles (AGV), roller tables, and an Automatic Storage and Retrieval System (ASRS). The shop floor layout of the AMRF is shown in figure 1.

2. AUDIENCE

The intended audience for this document are operators of the AMRF facility.

3. CONTENTS FLOW

This document includes operating instructions to startup and shutdown the material handling system. Also included are instructions to operate the AGV in its manual operating mode. Technical specifications for the AGV and ASRS equipment are given in the document "Material Handling Workstation, Recommended Technical Specifications for Procurement of Commercially Available Systems, NBSIR 88-3786". Additional documentation of the MHWS is given in the "Material Handling Workstation Implementation, NBSIR 88-3784" document.

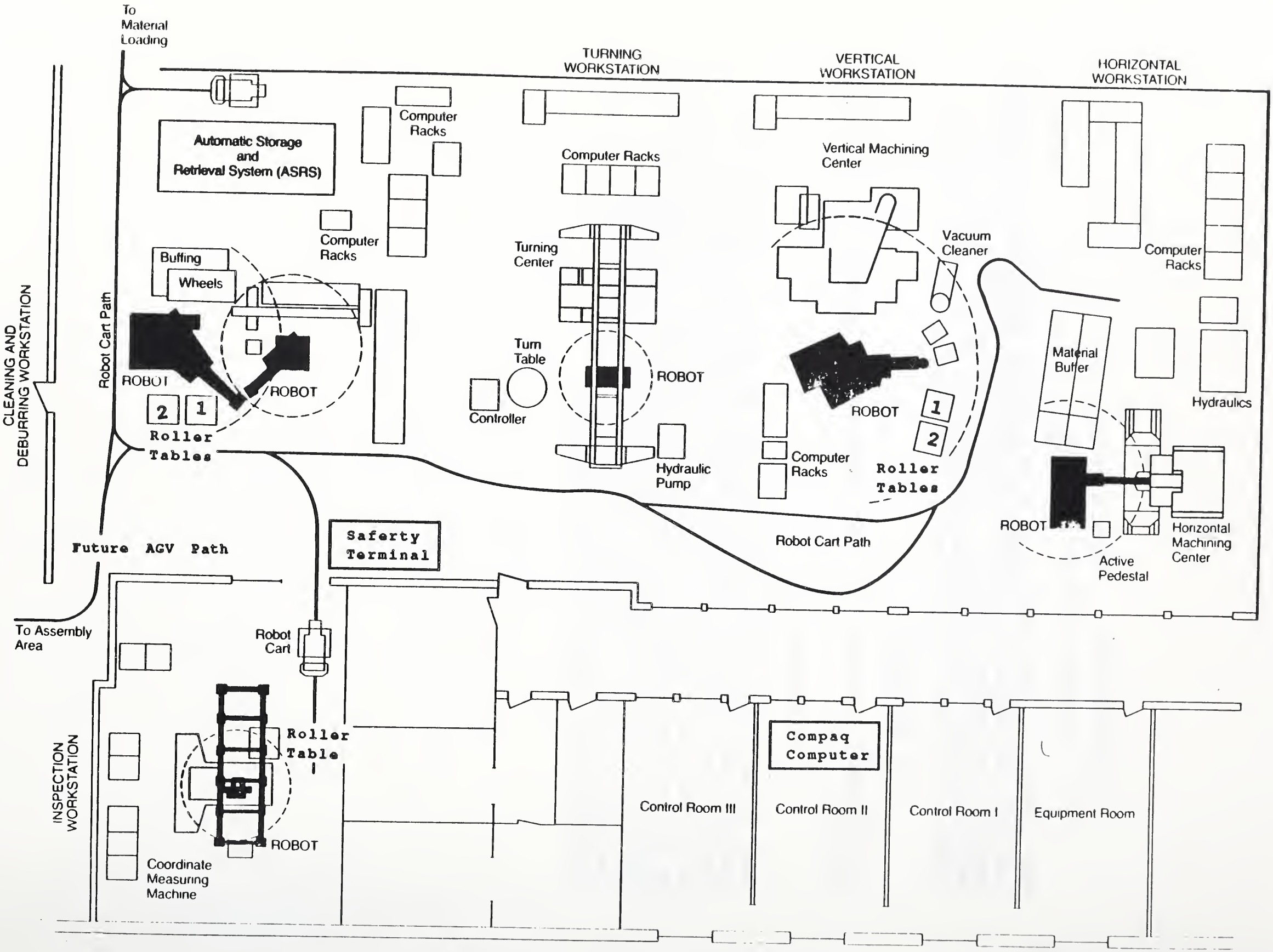

Figure 1. AMRF Floor Layout

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                                                       *
*  WARNING - Safety precautions described below must be                 *
*            observed when operating the AGV and ASRS.                  *
*                                                                       *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

II. MHWS STARTUP PROCEDURE

The MHWS equipment includes an AGV, an ASRS, five roller tables, a safety terminal, and a control computer. The configuration of the material handling equipment is shown in figure 2. To startup the equipment, follow steps 1 through 17 as listed below.

1. CONTROL COMPUTER

The MHWS control computer is a COMPAQ PORTABLE 286 system and is located in Control Room 1 on the desk facing the window. Power on the power strip on the desk and check that the computer powers on. Several screens of startup messages will be displayed. The last thing printed will be the operating system prompt which is a "C>" without the double quotes.

2. SAFETY TERMINAL

Go out on the shop floor and power up all the MHWS equipment. Start by powering on the Safety terminal outside the Inspection Work Station (IWS). Refer to the AMRF floor layout shown in figure 1 for the location of MHWS equipment.

3. AUTOMATIC STORAGE AND RETRIEVAL SYSTEM

Go to the Automatic Storage and Retrieval System (ASRS) and power on the first two modules by turning the key switches clockwise. Run the elevators up and down by entering commands on the keypads of each module. After each command, wait until the unit is ready for the next command. A ready is indicated when: elevator motion has stopped, a beep occurs, and one dot is displayed beside the number instead of two.

Move up: Press 3, 6 and Control on each unit and wait.
Move down: Press 1 and Control on each unit and wait.
Move to conveyor: Press 4 and Control on each unit.

If wrong numbers have been entered before the "Control" key is pressed, press the "Clr" key and try again. If wrong numbers are entered and "Control" is also pressed, the results are unpredictable. Therefore, care must be exercised to be sure that

Equipment of the AMRF Material Handling Workstation

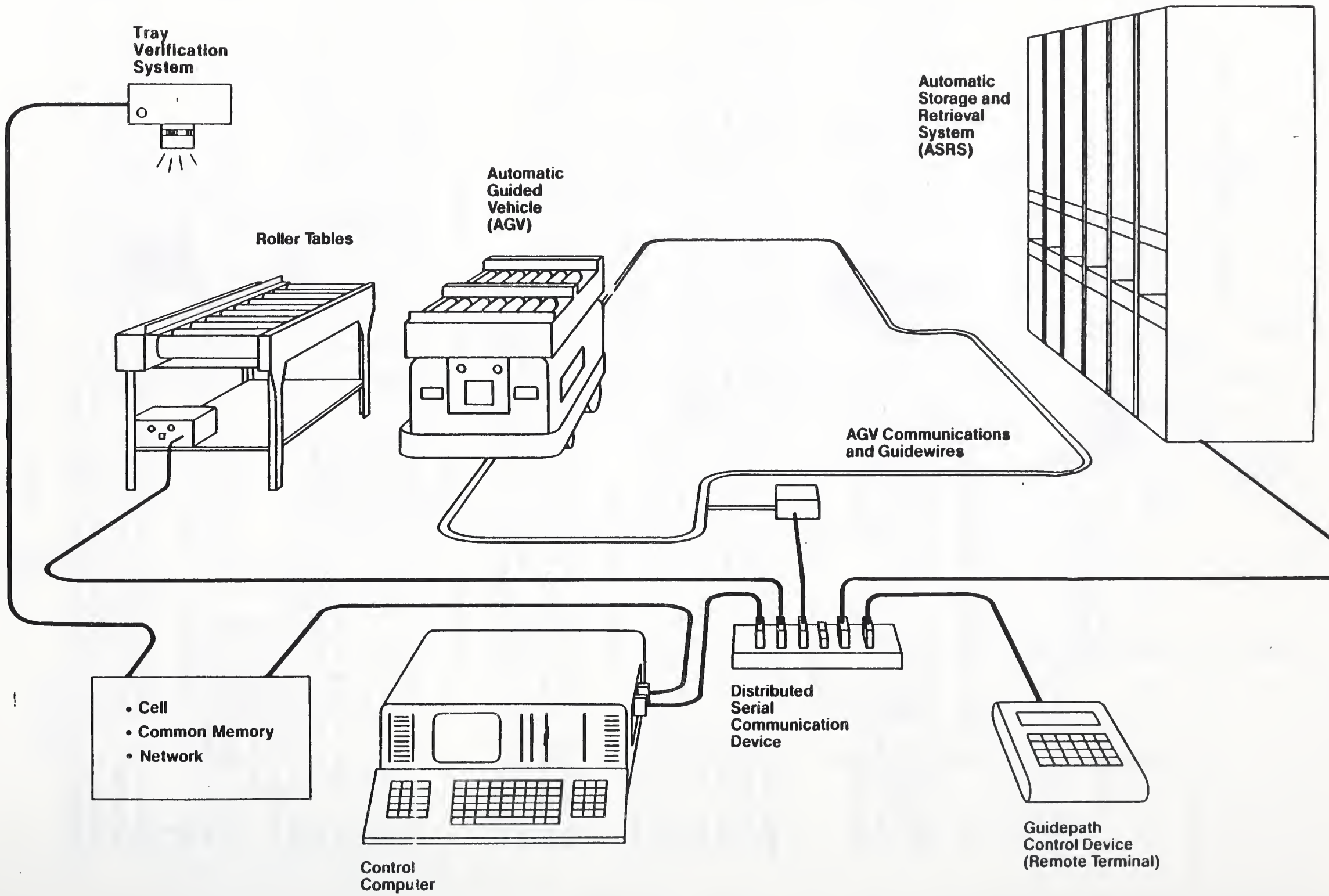

Figure 2. Material Handling Equipment

the correct numbers are entered before "Control" is pressed. If an error occurs indicated by "Err" on the display, press the "Clr" key and continue. Elevators should end up even with the conveyor. If not, do not proceed. Instead report the problem to Max Peltz or Carl Wenger.

For safety reasons, never reach inside the ASRS while the elevators are in motion.

4. AGV POWER ON

Check the manual control box on the back of the AGV and verify that the Auto/Manual switch is in the Auto position. If not, switch to the Auto position. Prepare to power on the Automatic Guided Vehicle (AGV) by turning the key switch clockwise. The switch is located on the right front of the vehicle. The switch may already be turned on since the AGV may be powered off without changing the switch. Press the large black reset button switch to complete the power on. Note battery level (gauge is located on right side above key switch). If the guage indicator is flashing, the battery should be charged before operation for more than 30 minutes.

5. AGV STARTING POSITION

Verify that the AGV is in position to tranfer a tray between the first ASRS unit and the front roller bed on the AGV. If not, follow the AGV Manual Operation Procedure to move the AGV to the correct position. As part of the safety procedure, power down the AGV by pressing the red button on the manual control box.

6. ROLLER TABLE CHECKOUT

Go to each workstation and write down the number of the tray on each workstation roller table for later verification on the COMPAQ computer. Check that power is on for each Reliance motor controller and that the Tray Station Controller's power is on and switch is in remote position. While walking to each workstation clear cart path of any obstructions.

7. CONTROL PROGRAM STARTUP

Return to Control Room 1 and enter the command "mhs". For this document, to enter a command means to type in the characters between the quotes and press the Enter or Return key. An initialization screen will be displayed as described in step 8 below.

8. TRAY NUMBER INITIALIZATION

The first screen displayed shows the initial conditions of the MHWS. The left side of the screen shows the tray numbers at each workstation. Check if the tray numbers displayed match the numbers actually on the roller tables. If the display values do not match the actual tray values, they must be changed. Move the cursor to the field to be changed by pressing the tab key or shift tab. The tab key is between the F4 and Q keys. Change the value and tab to the next field to be changed.

9. STARTUP PARAMETERS

The right side of the screen shows various other startup parameter values. Verify that the values are as follows;

```
dbug = 0
exec_mode = 3
auto_run = 0
switch1 = 1
agv_location = 1
agv_direction = 1
elem_num = 0
order_num = 0
```

If the values do not match, change them as described in step 8. When all display values are correct, press Enter.

10. SCREEN SELECTION

A different screen will now be displayed which includes a menu at the top of the display. Select menu item MHS. For this document, selecting a menu item means to press the left or right arrow keys on the numeric keypad on the right side of the keyboard until the item to be selected is shown within a bright rectanglar background and then press Enter.

11. EQUIPMENT CHECKOUT SCREEN

Select menu item EQUIP_CK to display the MHWS equipment check screen. All equipment to be used in the test or demo except AGV and SAFETY should be shown as Ready. If any tables to be used show Not Ready verify that the roller table controllers are powered on and press the red reset button switch. If any table is still shown as Not Ready, report the problem to the workstation manager.

12. SAFETY TERMINAL CHECKOUT

Enter a "G" on the Safety terminal as instructed and verify that a response message is printed verifying that the terminal is properly connected to the COMPAQ. Entering the "G" should also change the message "Please press the safety terminal 'G' key " to "Ready". If any equipment to be used is still not ready, contact Max Peltz or Carl Wenger.

13. ORDER ENTRY

If all necessary equipment is ready, operate the MHWS in its stand alone mode to check out the system by entering an order to deliver a tray to a workstation. Select menu item ORDER_ENTRY and press the up or down arrow keys to select the desired order. If the AGV is powered on and is ready, press Enter to execute the order. Press the Esc key to display the menu and select menu item TRAY_STATUS.

14. AGV SAFETY

For safety considerations, the AGV is powered down at this point in the procedure. Now power up the AGV by again pressing the large black button switch. The AGV may begin moving within several seconds after power up so stand clear. Follow the AGV around the shop floor until it returns to the ASRS. At all times while the AGV is powered on, be ready to press a red stop button if necessary. If a red stop button is pressed while the AGV is located away from its starting position, it must be manually returned to the starting position.

While the AGV is in motion, it may be safely stopped by pressing in the safety bumper. After several seconds, the operation will continue without re-initialization.

A third method of stopping the AGV operation, is to press a round black pause button located on both sides of the AGV near the rear. This has the effect of pausing the operation. Pressing the pause button again will resume the operation. This is the preferred method of stopping the AGV while it is following the guide wire around the shop floor.

15. SUN COMMUNICATIONS STARTUP

After the stand alone checkout is successfully completed, inform the AMRF operator that Material Handling is ready and checkout communications between the MHWS and CELL.

The Sun MHWS-CELL communications processes are usually started by either the Network operator or the AMRF operator. If they have not been started, ask the Network operator for permission to start the processes as described in the next two steps. If they have been started, proceed to step 16.

If the bottom line on the Sun display is "demo login: " (without the quotes) enter command "amrftest" to login to the amrftest account. If the Sun display shows two windows approximately 2 inches in height at the bottom of the display, the login step has already been done.

Move the mouse pointer to the bottom left window and enter commands "su wenger", "cd cmcell", "cd cell", and "cell". Move mouse pointer to bottom right window and enter "su wenger", "cd cmcell", "cd mhs", and "mhs". Enter an extra Return in each window.

16. ENABLE CELL-MHWS COMMUNICATIONS

Go back to Control Room 1 and enable communications on the MHWS control computer as follows; press the Esc key, select menu item SET_COMM. Select menu item CLEAR_MAILBOXES to clear the mailboxes of unwanted mail which may have been generated during the stand alone test. Next, select menu item COMM_SWITCH, and then select menu item ON. Verify that communications are established by observing the status bar at the bottom of the display. The COMM: field value should alternate between SND and RCV approximately every 8 seconds. If so, and if there were no problems in the previous steps, the MHWS startup procedure is complete and delivery of trays under CELL control may begin.

17. SAFE AGV OPERATION

To ensure safe operation of the AGV, an operator should be near the AGV at all times when it is moving and be ready to stop the AGV by pressing one of the red stop button switches or by pressing in a bumper. All personnel working in the immediate vicinity of the AGV path should be informed that AGV operations are about to begin. As soon as an AGV test operation is complete, power down the AGV.

III. MHWS SHUTDOWN PROCEDURE

1. EQUIPMENT POWER DOWN

Make sure that all tray deliveries have been completed, that the AGV is at the starting position by the ASRS, and that the ASRS is inactive. Power down the AGV by either pressing the red button switch on the manual control box or by turning the key switch counter clockwise. Power down both ASRS units by turning the key switches counter clockwise. Power down the Safety terminal near the IWS by switching the power switch to off. Exit the MHWS control program by selecting EXIT on the menu. Power down the MHWS COMPAQ control computer by switching the power strip switch to off.

IV. AGV MANUAL OPERATION

1. MHWS CONTROLLER CHECK

Be certain that the MHWS controller is not in operation. If it is, exit the control program. To exit the control program, check whether or not the computer is "hung up". If the control cycle counter and the time of day is changing, the program is likely not hung and a normal exit may be made by pressing the End key and then the Enter key twice. If the system seems hung, re-boot by holding down the Ctrl and Alt keys and pressing the Del key.

2. STARTING AND STOPPING AGV

Power on the AGV if necessary. Hold the manual controller box and move the speed lever all the way down. To move backward, the off-the-wire procedure in step 3 must always be used. If the AGV is on the wire, it may be moved forward to follow the wire without manually controlling the steering. Put the auto/manual switch in the auto position. Hold down the black button switch and slowly advance the speed control. To stop the AGV, let go of the black button switch.

3. OFF WIRE CONTROL

To move the AGV when it is off the wire, switch to the manual position, and set the direction to forward or reverse as desired. If the way is clear to go straight ahead or straight backwards, turn the steering knob to point straight ahead to the top of the box. Hold the black button down. Advance the speed control slowly until the AGV starts to move and then steer the AGV by slowly turning the steering knob as necessary.

4. AGV STARTING LOCATION

To return the AGV to its starting position by the ASRS, a combination of manual and automatic operations may be used. If the AGV is on the wire headed back towards the ASRS, only use automatic operation as described in step 2. If it is headed away from the ASRS, use the manual mode, forward and reverse directions, to maneuver the AGV to be on the wire headed toward the ASRS. Then use the automatic mode to take it the rest of the way back. When switching from the manual to the automatic mode, a relay click on the AGV indicates that the switch has been made. After any manual operation, a power down and power up must be done before operation controlled by the MHWS computer can continue.

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☐ Document describes a computer program; SF-185, FIPS Software Summary, is attached.

11. ABSTRACT *(A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here)*

The purpose of this document is to provide operating instructions for the AMRF Material Handling Workstation (MHWS). The material handling equipment includes Automatic Guided Vehicles (AGV) and an Automatic Storage and Retrieval System (ASRS). This document includes operating instructions to startup and shutdown the material handling system. Also included are instructions to operate the AGV in its manual operating mode.

12. KEY WORDS *(Six to twelve entries; alphabetical order; capitalize only proper names; and separate key words by semicolons)*

Material Handling Workstation; operator Manual; manufacturing; AMRF

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